PH 1110
Oct. 2, 1998

Name _____

EXAMINATION 3 (10:00 a.m.)

Circle your conference number:

1 (Iannacchione) 2 (Keil) 3 (Colonna-Romano) 4 (Streletsky)

5 (Jasperson) 6 (Streletsky)

50-Minute Duration; Closed Book; Closed Notes.

The exam total is 100 points; the point total per part is indicated inside.

To be eligible for full credit, show all work on these pages. If you require more than one page for an answer, place the EXTRA WORK on the BACK of the PRECEDING PAGE -- the page facing the problem statement.

Write your name where indicated on each page of the exam.

Express answers to three significant figures, with UNITS. Draw a solid line (BOX) around all numerical answers.

$\vec{v} = \frac{d\vec{r}}{dt}$, $\vec{a} = \frac{d\vec{v}}{dt}$, $speed = |\vec{v}|$, $Ave.\ Speed = \frac{Distance}{Time}$

$\vec{F}_{net} = m\vec{a}$, $F_f = \mu N$, $a_{rad} = \frac{v^2}{R}$, $g = 9.80\ m/s^2$

$W_{Tot} = \frac{1}{2}mv_f^2 - \frac{1}{2}mv_i^2$

$W_F = Fs\cos\phi$ (constant force)

$\frac{1}{2}mv_i^2 + mgh_i + \frac{1}{2}ks_i^2 + W_{other} = \frac{1}{2}mv_f^2 + mgh_f + \frac{1}{2}ks_f^2$

$\vec{J} = \vec{F}_{Ave}\Delta t = m\vec{v}_f - m\vec{v}_i$

$m_1\vec{v}_{1i} + m_2\vec{v}_{2i} + \cdots = m_1\vec{v}_{1f} + m_2\vec{v}_{2f} + \cdots$

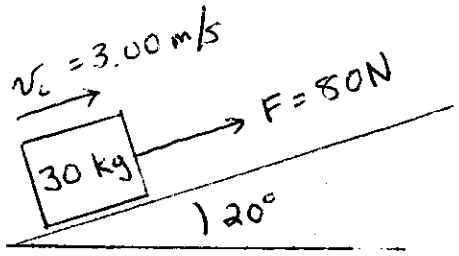
(no net ext. force)

1	
2	
Total	

PH 1110; A98; Exam 3a Last Name_____

(30 pts) PROBLEM 1A.

A 30.0 kg box with initial speed v_i = 3.00 m/s is pulled up a frictionless 20° incline by a constant 80.0 N force directed up the incline.



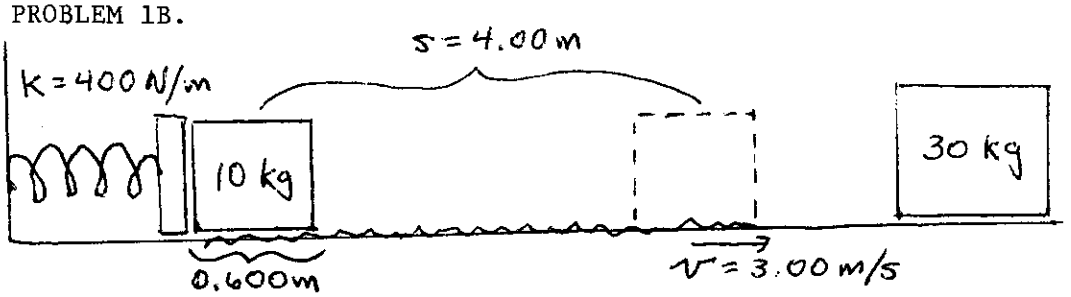
a) Draw a free-body diagram showing all forces acting on the box as it slides up the incline. Label each force with an appropriate symbol.

b) Calculate the work done by each force shown in (a) during a 4.00 m displacement up the incline.

c) Determine v_f, the speed of the box after a 4.00 m displacement up the incline.

PH 1110; A98; Exam 3a Last Name_____

(20 pts) PROBLEM 1B.



A 10.0 kg object is placed against a compressed spring and released from rest. (The spring has a spring constant k = 400 N/m and is compressed a distance of 0.600 m. The spring is NOT attached to the object.) Upon release, the object is projected across a frictional horizontal surface. After traveling a distance of 4.00 m, the object has a velocity of 3.00 m/s directed to the right.

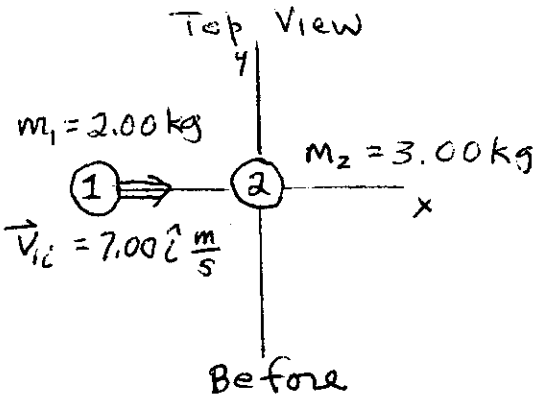
a) Determine the frictional work done on the object during this 4.00 m displacement.

b) The surface then becomes frictionLESS and the object, still with speed 3.00 m/s, collides with a 30.0 kg object initially at rest. After the collision, the 30.0 kg object is observed to be traveling to the right at 1.40 m/s. Determine the speed and direction of motion of the 10.0 kg object after the collision.

PH 1110; A98; Exam 3a Last Name_____

(50 pts) PROBLEM 2.

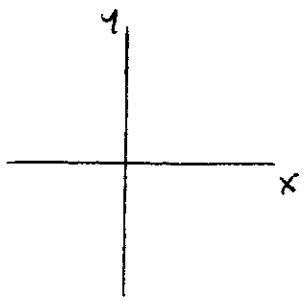
Mass m_1 traveling as shown across a frictionless horizontal xy plane collides with a stationary m_2 at the origin and both move off in new directions. After the collision, m_1 has a velocity of $\vec{v}_{1f} = (2.50\hat{i} + 3.00\hat{j})$ m/s.



a) Calculate the final velocity of m_2.

b) Calculate the impulse received by m_1 during the collision.

c) The duration of the collision is 4.00 ms. On the axes at right, sketch an arrow representing the direction of average force acting on m_1 during the collision, and determine a numerical value for the angular direction measured from the axis of your choice.



d) Calculate the total work done on m_1 during the collision.

e) Calculate the total work done on BOTH masses during the collision.